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(19)(CA) APPLICATION FOR CANADIAN PATENT (12)

(54) Cable-Clamping Device for a Synthetic Fibre Cable

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Cable-clamping device for a synthetic fibre cable

Description:

The invention starts out from a cable-clamping device for a synthetic fibre cable according to the classifying clause of the claim 1. Such a device for the staying of aerial or telescopic masts, which comprises a round rod fastened on a base plate and having a depression incised in thread shape, has become known from the DE 24 03 101 C1. This cable clamp is suitable only for a single cable and of relatively large and voluminous construction in each direction of extent by comparison with the diameter of the cable.

For certain applications such as lift plants, great cable lengths are neccesary on the one hand and the requirement for small moved masses exists for energy reasons on the other hand. High-tensile fibre cables of one-dimensional elongate molecule chains and a polyurethane sleeve protecting all round fulfill these demands. They are light, have a small diameter and a great tensile strength. Without reducing the tensile strength, such cables can absorb merely small transverse forces brought about by clamping or pressing.

On the other hand, several cables must be fastened lying one closely beside the other in lift construction. At the counterweight, for example, only a narrow surface of a width of 10 to 15 centimetres is as a rule available for fastening the cables. In the case of such space conditions, the known cable-clamping device is not usable because of its bulkiness. Projecting cable-clamping devices fan out the cable strand, which leads to an excessive wear of the cables and the cable grooves, in particular when the lift cage or the counterweight comes into the proximity of the drive pulley or the deflecting roller.

The invention characterised in the claims solves the problem of avoiding the disadvantages of the known device and creating a cable-clamping device for great loads, which is suitable for synthetic

fibre cables and enables the secure fastening of a greater number of cables lying closely one beside the other. The cable connection fulfills in particular the demands in lift construction, where great loads must be fixed on a small mounting area.

The advantages achieved by the invention are to be seen in that the fastened cables can run one beside the other over the closely adjacent grooves of the drive pulley without significant deflection. In particular when the cage or the counterweight reaches its point nearest to the drive pulley, a uniform loading of all cables is given thereby and no transverse forces arise, which - in particular in the case of cables lying at the outside - could lead to a stripping-off from the drive pulley.

The mode of construction, which is short in the direction of extent of the shaft, has the additional advantage that the shaft length can be fully utilised or that no additional increase in height of the shaft is required.

In addition, the tension force in the cable is largely taken up by the cable-clamping device by way of the high co-efficient of friction of the polyurethane sleeve in the cable groove and the cable is not stressed by clamping, which reduces the carrying force, transversely to the course of the fibres, in particular on entry into the run-off region of the cable grooves. It is also of advantage that unsheathed synthetic fibre cables can be fastened without cutting-open or damaging of the protective sheathing.

Several examples of embodiment of the invention are illustrated in the drawing and explained more closely in the following description. There show:

Fig. 1 a schematic elevation of a lift plant with cage and counterweight,

Fig. 2 an enlarged plan view onto a cable-clamping device according to a first example of embodiment,

Fig. 3 a second example of embodiment of a cable-clamping device in side elevation,

Fig. 4 schematically, a third example of embodiment of a cable-clamping device in plan view;

Fig. 5 a fourth example of embodiment of a cable-clamping device and

Figs. 6, 7 a fifth example of embodiment of a cable-clamping device.

According to Fig. 1, a cage 2 guided in a shaft 1 hangs at several cables 3 of synthetic fibres and running over a drive pulley 5 connected with a motor 4. Cable-clamping devices 6, at which the cables are fastened by one end, are situated on the cage 2. The respective other ends of the cables 3 are fastened in like manner at a counterweight 7, which is likewise guided in the shaft 1. The drive pulley 5 displays six grooves 8, which lie closely one beside the other, each for a respective cable. Drive pulleys with two to twelve grooves are usual in lift construction. In the uppermost storey, the cage 2 reaches its point nearest to the drive pulley, i.e. the cable-clamping devices 6 are situated directly below the drive pulley 5. When the cage stops in the lowermost storey, the cable-clamping devices 6 mounted at the upper side of the counterweight 7 are situated directly below the drive pulley 5.

Fig. 2 shows a cable-clamping device 6 in its details, wherein only portions of the cables 3 are drawn in for greater clarity. A cylindrical retaining drum 10, which is screwed by bent-over metal retaining plates 11 to be non-displaceable and non-rotatable, here for example at the counterweight 7, lies transversely to the cable direction which in Fig. 2 extends perpendicularly to the plane of the sheet. Three mutually adjacent cable grooves 12, which are formed as helically shaped spiral grooves in the same twist sense, extend over the entire length of the retaining drum. This simplifies production. A respective cable group 14 each of three cables 3 is wound onto the cables grooves 12 from a run-off region 13 in the middle of the retaining drum then towards both its ends. Both the cable groups 14 therefore run at a spacing one from the other off from opposite sides of the retaining drum 10. Seen transversely to the axis of the retaining drum 10, the cables 3 however lie one directly beside the other so as they run onto the drive pulley with six grooves lying one beside the other.

The groove width of the cable grooves 12 at the entry or the

run-off of the cables 3 in the middle of the retaining drum 10 corresponds to the cable diameter. Thereby, a lateral pressing, which reduces the carrying force, of the cable is avoided. On the entry of the loaded cables, the cable grooves 12 become progressively narrower in their cross-section so that the cable is gradually increasingly clamped laterally with reducing tension loading. In the drawing, the continuous reduction in cross-section is drawn as a step change for reasons of simplicity. The unloaded cable ends are fixed by clamping yokes 15 in the cable grooves, which yokes are suspended in the end faces and screw-fixed to the retaining drum after the first thread-shaped groove courses 16 of all cable grooves 12. The clamping brackets 15 are prolonged by securing brackets 17, which lie loosely against the greatest possible area and extend in axial direction of the retaining drum 10 and transversely across the cables 3 without being pressed against them. They prevent a dropping of the slack cables 3, in case of relief, out of the cable grooves 12.

In the example of embodiment, the retaining drum displays 3½ usable groove courses 16. According to magnitude of the load and conditions of friction, more or fewer groove courses can also be provided. The example of embodiment allows to be recognised that a single spiral groove, which is wound on by a respective cable from both ends, would already suffice for simple lifts with only two cables.

The tension force effective in a cable 3 is transmitted to the retaining drum 10 successively by way of friction in the associated cable groove 12. The synthetic fibre cable 3 is increasingly clamped laterally in the further course of the cable groove 12 becoming narrower. The transverse forces, which in that case increase gradually in the retaining drum 10 with increasing reduction in the tension force, remain locally so small that the original tensile strength of the cable 3 is not reduced.

In the case of expansion of a cable 3 caused by tensile stress, this can easily be retensioned in that it is at least partially wound off from the retaining drum 10 and subsequently wound on again with shortened cable length. Tools are not needed for this operation. A projecting cable end is simply cut off.

In the second example of embodiment according to Fig. 3, the cable-clamping device 6' consists of only one retaining drum 10', which has four spirally-shaped cable grooves 12', which lie one beside the other on each drum half. Both the groups of four have oppositely handed thread so that the cables 3 run off from the retaining drum 10' all lying directly one beside the other in one line and run at constant spacing onto the drive pulley 5 connected with the motor 4. The cables 3 are in turn fixed by clamping brackets 15 and secured by securing brackets 16.

The third example of embodiment shows how, with an arrangement of two or four retaining drums 10'', practically as many cables 3 as desired can run one directly beside the other off from the cable-clamping device 6 without letting the retaining drums 10'' become too long. In the case of the cable-clamping device 6'' according to Fig. 4, two retaining drums 10'' are arranged co-axially one behind the other each time and two such pairs one beside the other. Three cables 3 are wound onto each retaining drum 10'', thus twelve cables 3 altogether. Co-axially arranged retaining drums 10'' display spirally-shaped cable grooves 12'' with respectively oppositely handed thread and the cables 3 are wound on in the same winding direction so that they tend each time towards the mutually opposite ends of the retaining drums 10''. Retaining drums 10'' arranged one beside the other likewise display cable grooves 12'' with oppositely handed thread, in this case however also the winding direction of the cables 3 being opposite. This leads to the run-off regions 13'' of the cable grooves 12'' of all retaining drums 10'' facing one towards the other. Thereby, all cables 3 run off one directly beside the other and on about the same line.

The individual retaining drums 10'' can in case of need be constructed to be very thin, since the possible radius of curvature of a synthetic material cable 3 according to stiffness amounts to only one to six times the cable diameter. Thereby, the cable-clamping device 6 can be adapted individually to the dimensions or space conditions at the counterweight and the cage.

The cable-clamping device 6''' according to the fourth example of embodiment displays spiral grooves (12'''), which are formed as

planar curves winding around a point. The retaining drums 10''' are in this case flat discs with cable grooves 12''' milled into one end face and becoming gradually narrower in cross-section. The next retaining drum 10''' lying in contact can also take the place of a lid 18. The unloaded cable end is fixed by a clamping bracket 15'''. For the easier re-tensioning, the cable end can be led through a central opening 19 in the retaining drum 10''' or a central passage 20 in the lid 18. The passage 20 is expediently chosen to be so large that the screws of the clamping bracket 15''' are accessible without removal of the lid 18. Then, the lid 18 need only be loosened, but not taken off altogether for retensioning.

The cable-clamping device 6''' has the advantage of an extraordinarily narrow mode of construction, however requires a somewhat greater overall height in shaft direction than the solutions described earlier.

The disc-shaped retaining drums 10''' let themselves be arranged as group of four, for example as in the third example of embodiment. When more than four cables are needed, several retaining drums 10''' can be arranged one beside the other displaced obliquely each time by one groove width of the drive pulley 5 so that, seen transversely to the discs, the cables lie one directly beside the other.

The fifth example of embodiment according to Fig. 6 shows a constructionally particularly simple and economically built-up cable clamping device 6''''. The two mutually adjacent retaining drums 10'''' consist of two flat discs 21 preferably integrally connected together. Disposed therebetween each time is a cable groove 12'''' slightly enlarging outwardly. A cable 3 is spirally wound in this. The cable groove 12'''' is continuously narrower from the entry of the cable towards the interior and laterally clamps only the inner portion of the cable 3. The cable windings disposed one above the other exert the greatest pressure on the innermost winding. The outermost cable winding, which is loaded the most by the load, is thus laterally pressed not at all or only lightly.

The retaining drum 10'''' is axially pressed onto a cone 22, which is fixedly connected with a retaining bracket 23. For secure fixing of the retaining drum 10'''' this is fastened to the retaining bracket

23 by screws 24. Obviously, two or as many as desired pairs of retaining drums 10"" can be arranged each offset adjacent one another as schematically indicated in Fig. 7.

For retightening of the cable only the screws 24 need be loosened and the retaining drum 10"" lifted somewhat from the cone 22. Thereafter the retaining drum 10"" can be turned so far until the cable is tensioned. In that case the cable 3 is further wound up on the retaining drum 10"" without the departure point of the cable 3 transversely to the direction of the drive pulley grooves changing.

What has been said about the function of the first example of embodiment applies equally for the following ones. Of course, individual features of one example of embodiment, such as for example single-part and two-part retaining drums or the arrangement of the retaining drums one relative to the other, can be exchanged with those of other examples of embodiment.

Patent Claims

1. Cable-clamping device for synthetic fibre cables, in particular for lift cables (3), which comprises a retaining drum (10) with at least one incised cable groove (12) for the reception of the load-bearing cable (3), characterised thereby that the at least one retaining drum (10) is firmly connected with the cage (2) and/or the counterweight (7) of a lift, that several cable grooves (12), the groove courses (16) of which end or run out one directly beside the other for the run-off of the cables (3), are arranged one beside the other on one or more retaining drums (10) and that the cable grooves (12) become progressively narrower in their cross-section from the entry of the loaded cable.

2. Cable-clamping device according to claim 1, characterised thereby, that several retaining drums (10) are arranged in a row or one beside the other, wherein the run-off regions (13) of the cable grooves (12) each time face one the other.

3. Cable clamping device according to claim 1 or 2, characterised thereby that the cable groove (12"") accepts several windings of the cable (3) one above the other.

4. Cable-clamping device according to one of the claims 1 or 2, characterised thereby that co-axially arranged cable grooves (12) are each time wound with cables (3) to about half the opposite thread sense.

5. Cable-clamping device according to one of the preceding claims, characterised thereby that the cables (3) at their unloaded ends (3) are retained in the cable grooves (12) by lateral pressure, in particular by clamping brackets (15).

6. Cable-clamping device according to one of the preceding claims, characterised thereby that the cables (3) are secured in the cable grooves (12) against dropping-out by securing brackets (17).

7. Cable-clamping device according to one of the preceding claims, characterised thereby that co-axially arranged retaining drums (10") display cable grooves (12") each of respectively opposite hand, wherein the cables (3) are wound on in a winding direction of like sense so that the fastened cable ends each tend to move towards the mutually remote ends of the retaining drums (10").

8. Cable-clamping device according to one of the preceding claims, characterised thereby that retaining drums (10") arranged one beside the other display cable grooves (12") of opposite hand, wherein also the winding direction of the cables (3) is opposite.

9. Cable-clamping device according to one of the preceding claims, characterised thereby that the cable grooves as spiral grooves (12) are arranged helically on the retaining drums (10).

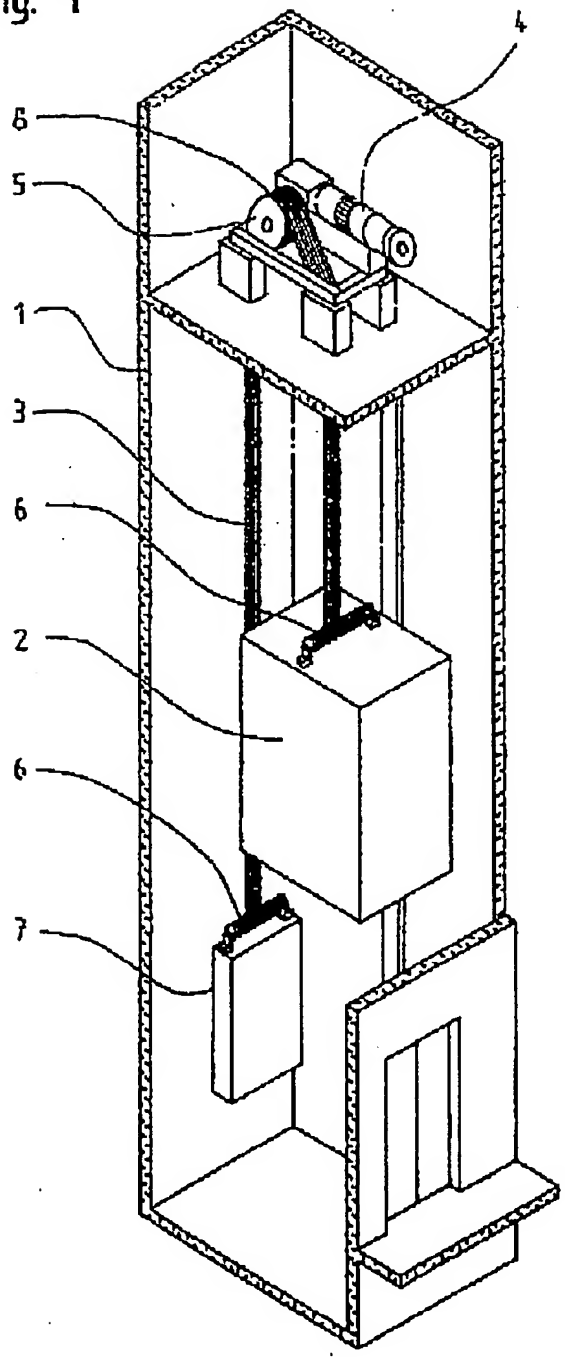
10. Cable-clamping device according to one of the preceding claims 1 to 8, characterised thereby that the cable grooves (12) are formed as planar spiral grooves winding around one point.

Summary:

The proposed cable-clamping device is suitable for highly loaded synthetic fibre cables (3) in lift construction, which can tolerate only small lateral pressures. It displays at least one retaining drum (10) connected firmly with either the cage (2) or the counterweight (7) of a lift. Several cable grooves (12), the grooves courses (16) of which end or run out one directly beside the other for the running-off of the cables (3), are arranged one beside the other on the retaining drum (10). The cable grooves (12) become progressively narrower in their cross-section from the entry of the loaded cable. Up to four and more retaining drums (10) are placeable one behind and beside the other in this manner, wherein the run-off regions (13) of the cable grooves (12) each time point one towards the other in order to avoid a fanning-out of the cables before the drive pulley.

(Fig. 2)

Fig. 1



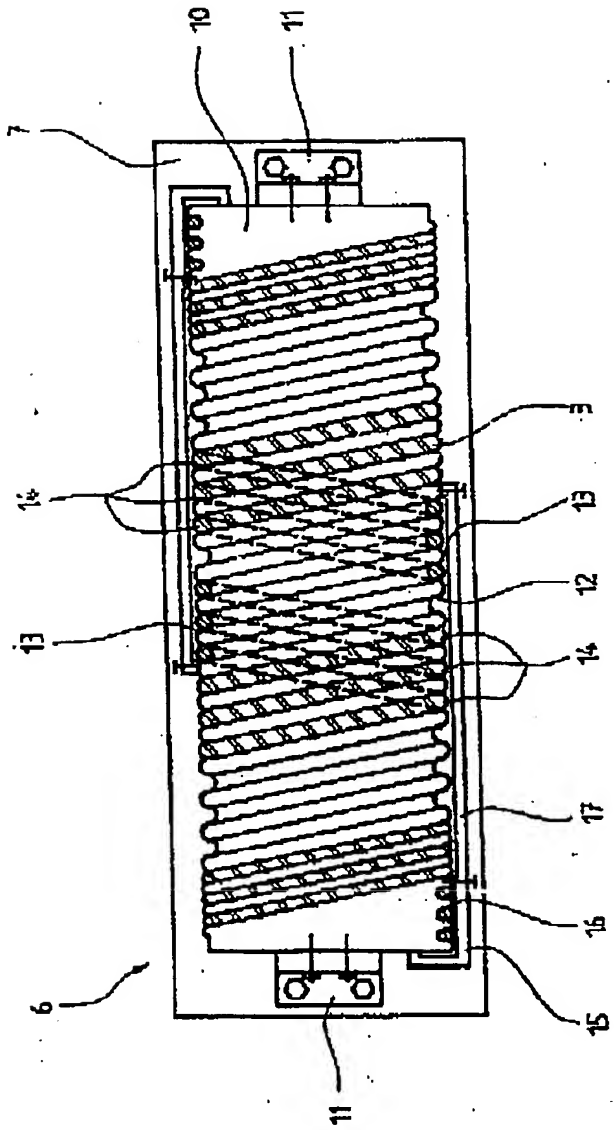


Fig. 2

Fig. 3

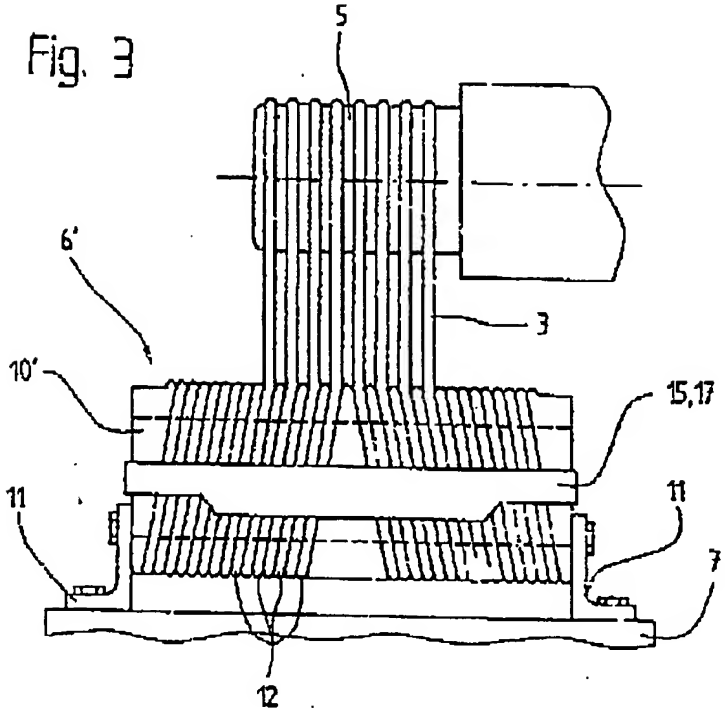


Fig. 4

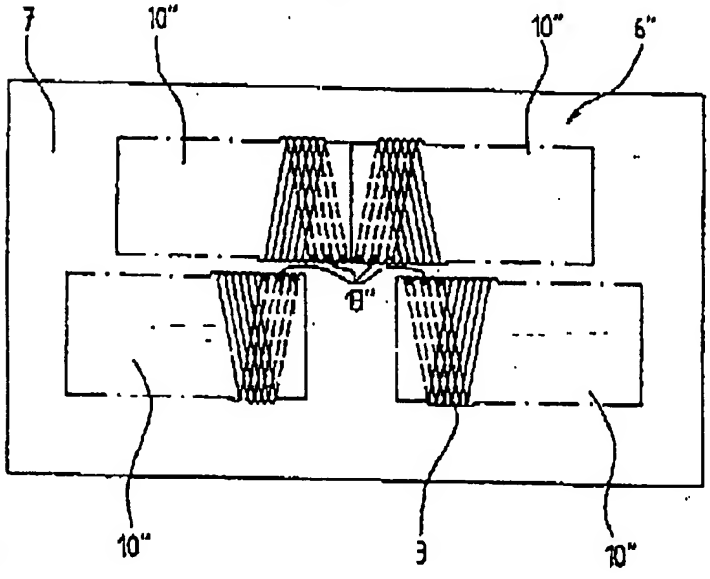


Fig. 5

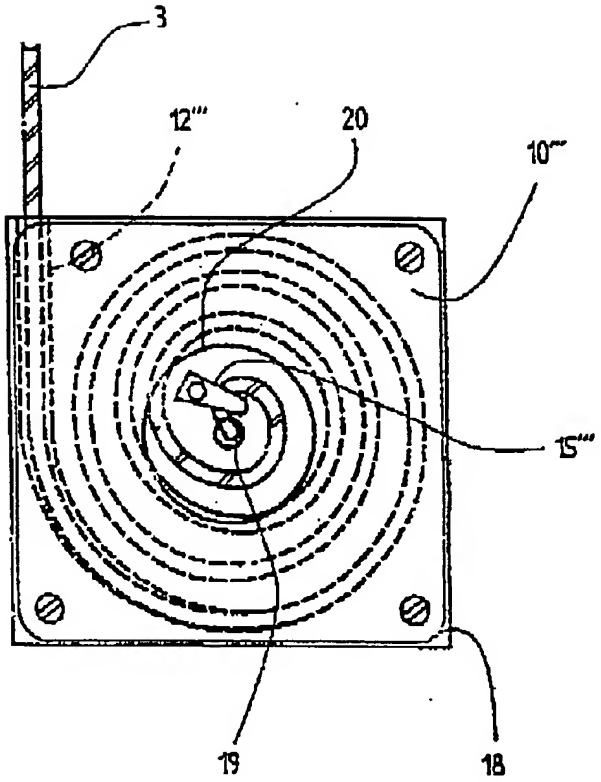


Fig. 6

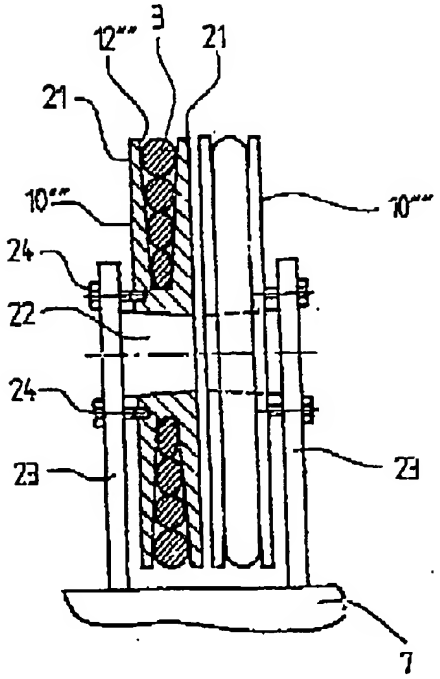


Fig. 7